

218c Integrating Ethics, Socio/Cultural Awareness, Diversity, and Contemporary Global Issues into the Introductory Chemical Engineering Curriculum

David DiBiasio, Stephanie Blaisdell, Calvin Hill, and Natalie Mello

Engineering educational outcomes clearly include technical mastery. However, we must also pay attention to professional issues that historically are not part of the classroom, particularly early in the curriculum. ABET criteria h, i, and j address these issues. Maintaining technical rigor commensurate with traditional courses while including new professional topics may be problematic. We piloted an integrated approach in two introductory chemical engineering courses taught in the fall, sophomore year. These courses included topics in material balances, thermodynamics, and equilibrium-based separations. Through various activities we established professional relevance, appropriate to the three ABET criteria, beyond traditional industrial examples. Our goals included engaging students in ethical issues and increasing their social, cultural, global, and diversity awareness within an engineering context.

Readings, regular homework, writing, team-based project activities and oral presentations were designed with integrated socio/cultural issues. An outside expert provided teamwork training that included ethics and gender issues in teamwork contexts. Other in and out-of-class work engaged students in global energy distribution and consumption, alternative energy production, and fresh water problems in West Africa; in power plant design and construction in southeast Thailand, and with contemporary diversity and pluralism issues on campus and in the chemical engineering workplace. Campus experts in intercultural awareness, globalization, women's issues, and diversity were engaged in several activities. These experts helped design some of the experiences and participated in some in-class sessions.

Assessment used four measures. The instructor's evaluation included normal grading and personal evaluation. A survey probed student reaction to diversity sessions. Content analysis of selected student writing was implemented. Focused exam questions provided an important writing source that gave evidence of student learning. One such exam question that was given early in the year was "recycled" in a follow-on spring course that was traditionally structured. This course devoted no additional attention to socio/cultural or other such issues. Content analysis showed that on average students were able to retain and apply some of first-order concepts presented several months earlier. Preliminary results indicate an improved understanding of cultural issues related to engineering, but ability to integrate appropriate socio-cultural considerations during calculation-intensive activities was inconsistent. Students' reaction to globally-related activities was more positive than those related to diversity. Additional evaluation is in-progress—a survey and writing assignment will be applied in late August to probe longer-term retention. Our presentation will include details of curriculum design, assessment analysis and discussion, and application for course improvements.